

Listing of the Claims

1-26. (Cancelled)

Claims Introduced in this Application:

27. (Previously presented) A process for delivering an angiogenic growth factor to the heart of a patient, including:

penetrating an element of a delivery device into heart tissue; and
with the element so penetrated, delivering an angiogenic growth factor to the tissue through the element.

28. (Previously presented) A process for treating the heart of a patient, including:
providing a catheter with a tissue penetrating element disposed at a distal end thereof;
inserting at least the distal end of the catheter into a chamber of the heart;
causing the penetrating element, while in the chamber of heart, to penetrate heart tissue;
and
after causing the penetrating element to penetrate heart tissue, delivering an angiogenic agent from the penetrating element to surrounding cardiac tissue.

29. (Amended) An apparatus for locally modifying electrical action within the heart, comprising:

a biocompatible, electrically inactive implant including an element for penetrating cardiac tissue to secure the implant at a designated site in a heart, to modify electrical action in the cardiac tissue at the designated site;

a delivery device releasably coupled to the implant to allow use of the delivery device to deliver the implant to the designated site, and further to allow a withdrawal of the delivery device after securing the implant; and

a fluid passage through the implant, open to an exterior of the implant at the penetrating element and at a proximal portion of the implant opposite the penetrating element, wherein the delivery device incorporates a lumen fluid coupled to the fluid passage at the proximal portion of the implant.

30. (Previously presented) An apparatus for delivering a pharmacological agent to the heart, including:

a catheter body having a proximal end, a distal end, and adapted to convey a pharmacological agent toward the distal end; and

a tissue penetrating structure releasably coupled to the distal end of the catheter body and adapted to deliver the pharmacological agent from the catheter body into heart tissue.

31. (Previously presented) A process for delivering an angiogenic agent to the heart, including:

providing a device having an element adapted to penetrate cardiac tissue;

inserting the device into a heart, and causing the element to penetrate tissue inside the heart; and

delivering an angiogenic agent through the penetrated element into surrounding tissue.

32. (Previously presented) The process of claim 27 wherein:

said penetrating the element of the delivery device positions the element inside a chamber of the heart.

33. (Previously presented) The process of claim 27 wherein:

the delivery device incorporates a controlled release matrix, and said delivering the angiogenic growth factor includes providing the angiogenic growth factor to the controlled release matrix.

34. (Previously presented) The process of claim 27 wherein:

said delivering the angiogenic growth factor comprises providing a controlled release of the angiogenic growth factor over an extended period of time.

35. (Previously presented) The process of claim 27 wherein:

at least part of the element is coated with a controlled release matrix, and said delivering the angiogenic growth factor comprises providing the angiogenic growth factor to the controlled release matrix.

36. (Previously presented) The process of claim 27 wherein:
the delivery device comprises a catheter having a distal end and adapted to support the delivery device at said distal end, and said delivering the angiogenic growth factor includes delivering the angiogenic growth factor through a lumen in the catheter.
37. (Previously presented) The process of claim 36 further including:
before said penetrating the element, inserting the distal end of the catheter into a chamber of the heart, and using the catheter to position the element at a site selected for said penetrating.
38. (Previously presented) The process of claim 28 wherein:
said delivering the angiogenic agent comprises delivering the angiogenic agent through a lumen in the catheter.
39. (Previously presented) The process of claim 28 further including:
after inserting at least the distal end of the catheter into a chamber of the heart, and before causing the tissue penetrating element to penetrate heart tissue, using the catheter to position the tissue penetrating element at a site selected for penetration.
40. (Previously presented) The process of claim 28 further including:
after delivering the angiogenic agent, removing the catheter to leave the penetrating element implanted in the heart tissue.
41. (Previously presented) The process of claim 28 wherein:
said delivering the angiogenic agent comprises using a controlled release mechanism associated with at least one of the penetrating element and the catheter.
42. (Previously presented) The process of claim 28 wherein:
said delivering the angiogenic agent includes providing a controlled release of the angiogenic agent over an extended period of time.
43. (Previously presented) The apparatus of claim 29 further including:
a controlled release matrix disposed along the implant for supplying a pharmacological agent to the cardiac tissue.

44. (Amended) The apparatus of claim 29 further including:
an electrode at a distal end of the delivery device for sensing electrical action in the cardiac tissue, to facilitate determining the designated site in the heart for penetrating cardiac tissue.
45. (Cancelled)
46. (Amended) The apparatus of claim 29 wherein:
the implant, at least over an outermost portion thereof that includes an exposed surface, is formed of an electrically conductive material.
47. (Previously presented) The apparatus of claim 30 further including:
a controlled release matrix disposed along the tissue penetrating structure for supplying the pharmacological agent to the heart tissue.
48. (Previously presented) The apparatus of claim 30 further including:
an electrode at the distal end of the catheter body for sensing electrical action in the heart tissue to facilitate locating a site for penetrating the heart tissue with the tissue penetrating structure.
49. (Previously presented) The apparatus of claim 30 further including:
a fluid passage through the tissue penetrating structure, open to an exterior of the tissue penetrating structure at opposite proximal and distal portions thereof.
50. (Previously presented) The apparatus of claim 49 wherein:
the catheter body incorporates a lumen fluid coupled to the fluid passage to facilitate conveying the pharmacological agent from the lumen to the heart tissue via the fluid passage.
51. (Previously presented) The process of claim 31 wherein:
said device incorporates a controlled release matrix, and said delivering the angiogenic agent through the penetrated element comprises providing the angiogenic agent to the controlled release matrix.
52. (Previously presented) The process of claim 31 wherein:

said delivering the angiogenic agent includes providing a controlled release of the angiogenic agent over an extended period of time.

53. (Previously presented) The process of claim 31 wherein:

said inserting the device into the heart comprises inserting a distal end of a catheter into a chamber of the heart, with said catheter supporting the device at said distal end.

54. (Previously presented) The process of claim 53 further including:

before causing the element to penetrate tissue inside the heart, using the catheter to position the element at a site selected for penetration.

55. (Previously presented) The process of claim 53 further including:

after causing the element to penetrate tissue inside the heart, removing the catheter to leave the element implanted in the tissue.

56. (Previously presented) The process of claim 27 wherein:

said penetrating an element of a delivery device comprises causing the element to penetrate endocardial tissue.

57. (Previously presented) The process of claim 36 wherein:

said delivering an angiogenic growth factor comprises using a controlled release mechanism associated with at least one of the element and the catheter.

58. (Previously presented) The apparatus of claim 43 wherein:

said pharmacological agent is selected from the group consisting of: antiarrhythmic agents, angiogenic growth factors, anti-inflammatory agents, and their combinations.

59. (Previously presented) The apparatus of claim 29 further including:

a controlled release mechanism associated with at least one of the implant and the delivery device, for supplying a pharmacological agent to the cardiac tissue.

60. (Previously presented) The apparatus of claim 29 wherein:

the implant, at least over an outermost portion thereof that includes an exposed surface, is formed of an electrically conductive material.

61. (Previously presented) The apparatus of claim 30 wherein:

said pharmacological agent is selected from the group consisting of: antiarrhythmic agents, angiogenic growth factors, anti-inflammatory agents, and their combinations.

62. (Previously presented) The apparatus of claim 30 further including:

a controlled release mechanism associated with at least one of the tissue penetrating structure and the catheter body, for supplying a pharmacological agent to the cardiac tissue.

63. (Previously presented) The apparatus of claim 30 wherein:

the tissue penetrating structure, at least over an outermost portion thereof that includes a surface exposed when the tissue penetrating structure is penetrated into heart tissue, is formed of an electrically conductive material.

64. (Previously presented) The process of claim 53 wherein:

said delivering an angiogenic agent comprises using a controlled release mechanism associated with at least one of the device and the catheter.

65. (Amended) A process for locally modifying electrical action in tissue at a designated site in the region of the heart; including:

using a delivery device to introduce a biocompatible, electrically inactive implantable device including a tissue penetrating element into the region of the heart, and to guide the implantable device to a designated site in said region;

causing the tissue penetrating element to penetrate tissue to secure the implantable device at the designated site; and

with the implantable device so secured, decoupling the delivery device from the implantable device, and withdrawing the delivery device from the designated site;

wherein the implantable device is provided with a substance capable of locally modifying electrical action in tissue at the designated site, and said causing the tissue penetrating element to penetrate tissue delivers the substance into contact with the tissue at the designated site.

66. (Previously presented) The process of claim 65 wherein:

the delivery device comprises a catheter, and said using the catheter comprises intravascularly delivering the implantable device.

67. (Previously presented) The process of claim 65 wherein:

said causing the tissue penetrating element to penetrate tissue comprises manipulating a proximal end of the delivery device while the implantable device is coupled to a distal end of the delivery device.

68. (Amended) An apparatus for locally modifying electrical action in tissue at a designated site in the region of the heart, comprising:

a biocompatible, electrically inactive implant including an element for penetrating tissue to secure the implant at a designated site in the region of the heart, to modify electrical action in the tissue at the designated site;

a substance disposed on the implant, said substance being capable of locally modifying electrical action in tissue after being placed into contact with said tissue; and

a delivery device releasably coupled to the implant to allow use of the delivery device to deliver the implant to the designated site, and further to allow a withdrawal of the delivery device after securing the implant.

69. (Previously presented) The apparatus of claim 68 wherein:

the delivery device and the implant are threadedly coupled.

70. (Previously presented) The apparatus of claim 68 wherein:

the implant and the delivery device are coupled through an elliptical coupling feature disposed at one end of the implant.

71. (Previously presented) The apparatus of claim 68 wherein:

the penetrating element is helical.

72. (Amended) An apparatus implantable in tissue at a designated site in the region of the heart, including:

a biocompatible, electrically inactive implantable device comprising a tissue penetrating element for penetrating tissue to secure the implantable device at a designated site in the region of the heart, thereby to modify electrical action in tissue at the designated site;

wherein the implantable device further comprises a coupling structure for releasably coupling the implantable device to a delivery device to enable use of the delivery device to deliver the implantable device to the region of the heart, to position the implantable device at the

designated location, and to cause the penetrating element to penetrate tissue to secure the implantable device at the designated site;

wherein the coupling structure is adapted to allow a disengagement and removal of a delivery device from the implantable device, following use of the delivery device to so secure the implantable device; and

wherein the coupling structure is selected from the group of coupling structures consisting of: threads disposed at a proximal end of the implantable device; and an elliptical feature disposed at a proximal end of the implantable device.

73. (Previously presented) The apparatus of claim 72 further including:

a delivery device releasably coupled at a distal end thereof to the implantable device by said coupling structure, and operable at a proximal end thereof to cause the penetrating element to penetrate tissue to so secure the implantable device.

74. (Previously presented) The apparatus of claim 73 wherein:

the delivery device comprises an elongate catheter adapted to intravascularly deliver the implantable device.

75. (Previously presented) The apparatus of claim 73 wherein:

the delivery device comprises a stylet.

76. (Cancelled)

77. (Cancelled)

78. (Previously presented) The apparatus of claim 72 wherein:

the tissue penetrating element is helical.

79. (Previously presented) The apparatus of claim 29 wherein:

said electrically inactive implant further includes a coupling structure adapted to form a releasable coupling of the implant with the delivery device, and the delivery device is releasably coupled to the implant through the coupling structure, whereby the delivery device is operable through said releasable coupling to cause the element to penetrate cardiac tissue to secure the implant at the designated site.

80. (Cancelled)

81. (Amended) The process of claim 65 wherein:

said substance is selected from the group consisting of a polymeric substrate, a chemical, a drug, a controlled release matrix, an antiarrhythmic agent, and their combinations.

82. (Amended) The process of claim 65 wherein:

said substance is a controlled release matrix containing an antiarrhythmic agent, and the antiarrhythmic agent is delivered to said tissue in a sustained release from said matrix.

83. (Amended) The process of claim 65 further including:

prior to using a delivery device to introduce the implantable device, using a coupling structure of the implantable device to releasably couple the implantable device with the delivery device, wherein said decoupling and withdrawing of the delivery device leave only the implantable device at the designated site.

84. (Cancelled)

85. (Amended) The apparatus of claim 68 wherein:

said substance is selected from the group consisting of a polymeric substrate, a chemical, a drug, a controlled release matrix, an antiarrhythmic agent, and their combinations.

86. (Amended) The apparatus of claim 68 wherein:

said substance is a controlled release matrix containing an antiarrhythmic agent, and the antiarrhythmic agent is deliverable to said tissue in a sustained release from said matrix.

87. (Previously presented) The apparatus of claim 68 wherein:

said electrically inactive implant further includes a coupling structure adapted to form a releasable coupling of the implant with the delivery device, and the delivery device is releasably coupled to the implant through the coupling structure, whereby the delivery device is operable through the releasable coupling to cause the element to penetrate tissue to secure the implant at the designated site.

88. (Previously presented) The apparatus of claim 72 further comprising:
a substance disposed on the electrically inactive implantable device, said substance being
capable of locally modifying electrical action in tissue after being placed into contact with said
tissue.

89. (Previously presented) The apparatus of claim 88 wherein:
said substance is selected from the group consisting of a polymeric substrate, a chemical,
a drug, a controlled release matrix, an antiarrhythmic agent, and their combinations.

90. (Previously presented) The apparatus of claim 88 wherein:
said substance is a controlled release matrix containing an antiarrhythmic agent, and the
antiarrhythmic agent is deliverable to said tissue in a sustained release from said matrix.

91. (Previously presented) An apparatus for locally modifying electrical action
within the heart, comprising:

a biocompatible, electrically inactive implant including an element for penetrating
cardiac tissue to secure the implant at a designated site in a heart, to modify electrical action in
the cardiac tissue at the designated site;

a delivery device releasably coupled to the implant to allow use of the delivery device to
deliver the implant to the designated site, and further to allow a withdrawal of the delivery
device after securing the implant; and

a controlled release matrix disposed along the implant for supplying a pharmacological
agent to the cardiac tissue.

92. (Previously presented) The apparatus of claim 91 wherein:
the implant, at least over an outermost portion thereof that includes an exposed surface, is
formed of an electrically conductive material.

93. (Previously presented) An apparatus for locally modifying electrical action
within the heart, comprising:

a biocompatible, electrically inactive implant including an element for penetrating
cardiac tissue to secure the implant at a designated site in a heart, to modify electrical action in
the cardiac tissue at the designated site;

a delivery device releasably coupled to the implant to allow use of the delivery device to deliver the implant to the designated site, and further to allow a withdrawal of the delivery device after securing the implant; and

a controlled release mechanism associated with at least one of the implant and the delivery device, for supplying a pharmacological agent to the cardiac tissue.

94. (Previously presented) The apparatus of claim 93 wherein:

the controlled release mechanism is disposed along the implant.

STATUS OF CLAIMS

The following claims have been cancelled from this application:

Claims 1-26 (of U.S. Patent No. 5,551,427)

Claims 45, 76-77, 80, and 84

The following claims are pending in this application:

Claims 27-28, 30-44, 47-64, 66-67, 69-71, 73-75, 78-79, 83, and 87-94,
previously presented.

Claims 29, 46, 65, 68, 72, 81-82, and 85-86, amended.